

AMENDMENTS TO THE CLAIMS

The following listing of claims will replace all prior versions and listings of the claims in this application:

1. (Currently Amended). A design template for use with a seat, comprising:
a torso section ~~being~~ representing a torso of one of a large male, a medium male and a small female having one of an ERECT posture, a NEUTRAL posture and a SLUMPED posture and at least one anatomical landmark; and
at least one cross-sectional section of the torso cooperating with said torso section at the anatomical landmark, the at least one cross-sectional section representing a cross-section of the torso and being generally at a right angle to the torso section and describing a body seat interface at the at least one anatomical landmark, the anatomical landmark being located on the body seat interface, the body seat interface described by the torso section and the at least one cross-sectional section being three dimensional.
2. (Original). A design template as set forth in claim 1 wherein said torso section has a portion of an outer contour conforming to a deformed shape of an interface contour between a seat and a seated occupant.
3. (Original). A design template as set forth in claim 2 wherein said torso section includes anatomical details located relative to each other and the interface contour is relative to said anatomical details.

4. (Original). A design template as set forth in claim 1 wherein said torso section includes indicia of skeletal landmarks for a shoulder joint and a hip joint and an axis connected therebetween.

5. (Original). A design template as set forth in claim 1 wherein said torso section includes a centerline projection of a pelvis with indicia representing an ischial tuberosity, anterior superior iliac spine, pubic symphysis and sacrum.

6. (Original). A design template as set forth in claim 1 wherein said torso section includes an angular scale for torso angle.

7. (Original). A design template as set forth in claim 1 wherein said torso section includes an angular scale for hip angle.

8. (Original). A design template as set forth in claim 1 wherein said torso section has an anterior shape that is anthropometrically and anatomically correct.

9. (Currently Amended). An occupant restraint system for a seat comprising:
a lap belt being anchored to vehicle structure to extend below an anterior superior iliac spin and above an anterior inferior iliac spine for a design template with a torso section being representing a torso of one of a large male, a medium male, and a small female and having one of an ERECT posture, a NEUTRAL posture and a slumped posture; and

a shoulder belt being anchored to vehicle structure to extend between a first predetermined distance from a centerline of the seat to a should joint for the design template, said design template including at least one cross-sectional section representing a cross-section of the torso and cooperating with said torso section at an anatomical landmark, the at least one cross-sectional section being generally at a right angle to the torso section and describing a body seat interface at the at least one anatomical landmark, the anatomical landmark being located on the body seat interface, the body seat interface described by the torso section and the at least one cross-sectional section being three dimensional.

10. (Original). An occupant restraint system as set forth in claim 9 wherein said first predetermined distance is 190 mm for the small female, 246 mm for the medium male and 267 mm for the large male, and said second predetermined distance is 51 mm for the small female, 65 mm for the medium male and 71 mm for the large male.

11. (Currently Amended). A method of establishing occupant accommodation criteria in a vehicle package based on a predetermined class of vehicles comprising:

providing a design template having a torso section ~~being~~ representing a torso of one of a large male, a medium male and a small female having one of an ERECT posture, a NEUTRAL posture and a SLUMPED posture and having a leg section and at least one cross-sectional section cooperating with said torso section at an anatomical landmark and describing a shape of a body seat interface, the at least one cross-sectional section representing a cross-section of the torso and being generally at a right angle to the torso section, the anatomical landmark being located on the body seat interface, the body seat

interface described by the torso section and the at least one cross-sectional section being three-dimensional;

defining a planar region under an accelerator to provide a heel point for the leg section;

defining seat stiffness of a seat whether stiffness (hard) , low stiffness (soft) or some stiffness therebetween;

positioning the design template in the vehicle such that the eye line of sight is within vision requirements of the vehicle environment; and

positioning the design template in the vehicle such that the distance between the supplemental restraint system in the steering wheel to chest is as great as possible to provide a safe distance for each occupant driving the vehicle.

12. (Original). A method as set forth in claim 11 including the step of adjusting joint angles at an ankle, knee, and hip of the design template to lie within a predetermined range.

13. (Original). A method as set forth in claim 11 including the step of reclining the torso section a predetermined angle from vertical.

14. (Original). A method as set forth in claim 11 including the 25 step of defining the seat design position at the rearmost and downmost position of the seat in the vehicle package.

15. (Currently Amended). A method for designing a seat comprising:
selecting at least one design template having a torso section being representing a torso of
one a large male, a medium male and a small female having one of an ERECT posture, a
NEUTRAL posture and a SLUMPED posture and having a leg section and at least one
cross-sectional section cooperating with said torso section at an anatomical landmark, the
at least one cross-sectional section representing a cross-section of the torso and being
generally at a right angle to the torso section and describing a body seat interface at the
anatomical landmark, the anatomical landmark being located on the body seat interface,
the body seat interface described by the torso section and the at least one cross-sectional
section being three dimensional;

forming load supporting contours of the occupied seat for the at least one design
template; and

forming unloaded patches of the unoccupied seat for the at least one design
template.

16. (Original). A method as set forth in claim 15 including the step of defining
an offset surface contour of the design template in the occupied seat and seat structure.

17. (Original). A method as set forth in claim 15 including the step of
estimating a first point of a shoulder patch on a seat back at a T4 spinal landmark.

18. (Original). A method as set forth in claim 15 including the step of
estimating a first point of the load supporting patch of a seat back at S^o under occupant
load.

19. (Original). A method as set forth in claim 18 including the step of estimating a second point at S° on the unloaded patch of the seat back.

20. (Original). A method as set forth in claim 15 including the step of estimating a first point of a load supporting patch of a seat back at L° under occupant load.

21. (Original). A method as set forth in claim 20 including the step of estimating a second point at LU on an unloaded patch of the seat back.

22. (Original). A method as set forth in claim 15 including the step of estimating a point on a bite line patch of a seat back at "B" .

23. (Original). A method for as set forth in claim 15 including the step of estimating a first point of a load supporting patch of a seat cushion at I_D° under occupant load.

24. (Original). A method as set forth in claim 23 including the step of estimating a second point at I_D° on an unloaded patch of the seat cushion.

25. (Original). A method a set forth in claim 15 including the step of estimating a first point of a load supporting patch of a seat cushion at T° under occupant load.

26. (Original). A method as set forth in claim 25 including the step of estimating a second point at T^U on an unloaded patch of the seat cushion.

27. (Original). A method as set forth in claim 26 including the step of optimally matching the unoccupied load support points for the other torso sections and postures of the design template to define the unoccupied seat patch.

28. (Original). A method as set forth in claim 27 including the step of constructing an unloaded point S^U for each of the design templates.

29. (Original). A method as set forth in claim 27 including the step of constructing an unloaded point L^U for each of the design templates.

30. (Original). A method as set forth in claim 27 including the step of constructing an unloaded point I_D^U for each of the design templates.

31. (Original). A method as set forth in claim 27 including the step of constructing an unloaded point T^U for each of the design templates.

32. (Original). A method as set forth in claim 15 including the step of defining an unoccupied seat region patch for a shoulder.

33. (Original). A method as set forth in claim 15 including the step of defining an unoccupied seat patch for a thorax region.

34. (Original). A method as set forth in claim 15 including the step of defining an unoccupied seat patch for a lumbar.

35. (Original). A method as set forth in claim 15 including the step of defining an unoccupied seat patch for a bite line.

36. (Original). A method as set forth in claim 15 including the step of defining an unoccupied seat patch for an ischium.

37. (Original). A method as set forth in claim 15 including the step of defining an area for a seat suspension in the seat.

38. (Original). A method as set forth in claim 15 including the step of defining an unoccupied seat patch for a thigh.

39. (Original). A method as set forth in claim 15 including the step of defining a waterfall region of an unoccupied seat.

40. (Currently Amended). A method of using a design template to design a vehicle seat comprising:

providing at least one design template having a torso section being representing a torso of one of a large male, a medium male and a small female having one an ERECT posture, a NEUTRAL posture and a SLUMPED posture and at least one cross-sectional

section cooperating with said torso section at an anatomical landmark, the anatomical landmark being located on the body seat interface, the at least one cross-sectional section representing a cross-section of the torso being generally at a right angle to the torso section to provide a three-dimensional design template,;

establishing occupant accommodation criteria based on positioning the at least one design template in a predetermined class of vehicles to define occupied seat position to accommodate ~~each~~ the at least one design template on a seat having a seat cushion and a seat back in a vehicle representing the vehicle package criteria; and

defining at least one from a group comprising unloaded patches on the seat at A, S^U , L^U , B, I_D^U and T^U ;

defining at least one from a group comprising a seat back height, seat cushion length, head restraint position, shoulder patch, thorax patch, lumbar patch, bite line patch, ischial patch, thigh patch, seat cushion bolster, and seat suspension for the seat relative to the design template.

41. (Original). A method as set forth in claim 40 wherein said step of defining a seat back height for the seat relative to the design template comprises terminating a seat back height relative to the design template at or above a top of the shoulder patch.

42. (Original). A method as set forth in claim 40 wherein said step of defining a seat back height for the seat relative to the design template comprises locating a top cross member of the seat back frame relative to the design template at a position equal to or higher than the thorax patch in the unoccupied seat.

43. (Original). A method as set forth in claim 40 wherein said step of defining a head restraint position for the seat relative to the design template comprises determining a position of a center of mass of a head for the torso section relative to the design template, locating a back of a head for the torso section of the large male relative to the determined position of the center of mass of the head, and defining a lowest maximum height of the head restraint relative to the design template at the back of the head for the torso section of the large percentile male having the ERECT posture.

44. (Original). A method as set forth in claim 40 wherein said step of defining a shoulder patch for the seat relative to the design template comprises defining an area for the shoulder patch relative to the design template between a T4 contact zone for the torso section of the large male having the ERECT posture and the T4 contact zone for the torso section of the medium male having the SLUMPED posture.

45. (Original). A method as set forth in claim 40 wherein said step of defining a thorax patch for the seat relative to the design template comprises defining an area for the thorax patch relative to the design template between a thorax seat patch for the torso section of the large male having the ERECT posture and the thorax seat patch for the torso section of the small female having the SLUMPED posture.

46. (Original). A method as set forth in claim 40 wherein said step of defining a lumbar patch for the seat relative to the design template comprises defining an area for the lumbar patch relative to the design template between a lumbar seat patch for the torso

section of the large male having the ERECT posture and the lumbar seat patch for the torso section of the small female having the SLUMPED posture.

47. (Original). A method as set forth in claim 40 wherein said step of defining a lumbar patch for the seat relative to the design template comprises locating a two-way, horizontal displacement, adjustable lumbar support for the seat relative to the design template midway between and the highest and lowest locations of L4 for the torso sections of the design template.

48. (Original). A method as set forth in claim 40 wherein said step of defining a lumbar patch for the seat relative to the design template comprising locating a minimal vertical displacement of an adjustable lumbar support for the seat relative to the design template representing the highest and lowest locations of L4 for the torso sections of the design template.

49. (Original). A method as set forth in claim 40 wherein said step of defining a seat suspension for the seat relative to the design template comprises defining an area for the seat suspension relative to the design template between a furthest forward and rearward ischial load points for the torso section of the large male having the SLUMPED posture and for the torso section of the small female having the ERECT posture.

50. (Original). A method as set forth in claim 40 wherein said step of defining a seat cushion length for the seat relative to the design template comprises terminating a

length of the seat cushion relative to the design template from ID on the torso section of the small female.

51. (Currently Amended). A seat comprising:

a seat cushion;

a seat back associated with said seat cushion; and

at least one from a group comprising a seat back height, seat cushion length, head restraint position, shoulder patch, thorax patch, lumbar patch, bite line patch, ischial patch, thigh patch, and seat suspension being defined for said seat cushion and said seat back relative to a design template having a torso section being representing a torso of one of a large male, a medium male and a small female having one of an ERECT posture, a NEUTRAL posture and a SLUMPED posture and at least one cross-sectional section cooperating with said torso section at an anatomical landmark, the at least one cross-sectional section representing a cross-section of the torso and being generally at a right angle to the torso section and describing a body seat interface at the anatomical landmark, the anatomical landmark being located on the body seat interface, the body seat interface described by the torso section and the at least one cross-sectional section being three-dimensional.

52. (Original). A seat as set forth in claim 51 wherein said seat back height of said seat back terminates at or above a top of the shoulder patch on the unloaded seat surface of the seat.

53. (Original). A seat as set forth in claim 51 wherein said seat back includes a top cross member at a position equal to or higher than the thorax patch in the unoccupied seat.

54. (Previously Amended). A seat as set forth in claim 51 wherein said head restraint position is located relative to a position of a back of a head for the torso section.

55. (Original). A seat as set forth in claim 51 wherein said two-way, horizontal displacement, lumbar support is located between the highest and lowest locations of L4 for the torso sections of the design template.

56. (Original). A seat as set forth in claim 55 wherein said lumbar support is located for minimal vertical displacement to be between on the highest and lowest locations of L4 on the lumbar patch of torso sections of the design template.

57. (Original). A seat as set forth in claim 51 wherein said seat cushion length terminates at a back of a calf of the torso section for the small female sitting in a position on the seat that accommodates her driving position.

58. (Original). A seat as set forth in claim 51 wherein said seat suspension is defined in an area under the ischial patch for the torso section of the large male having the SLUMPED posture and for the torso section of the small female having the ERECT posture.

59. (Original). A seat as set forth in claim 51 including a seat anti-submarining restraint system defined in an area between a furthest forward ischial load zone for the torso section of the high clearance offset for the design template and the vertical barrier at the nose of the seat cushion to horizontal motion of the ischium for the design template.

60. (Currently Amended). A design template for use with a seat, comprising:
a torso section representing a torso and having at least one anatomical landmark;
and
at least one cross-sectional section cooperating with said torso section at the anatomical landmark, the at least one cross-sectional section being generally at a right angle to the torso section and describing a body seat interface at the at least one skeletal landmark, the anatomical landmark being located on the body seat interface, the body seat interface described by the torso section and the at least one cross-sectional section being three dimensional.

61. (Currently Amended). An occupant restraint system for a seat, comprising:
a lap belt being anchored to vehicle structure to extend below an anterior superior iliac spin and above an anterior inferior iliac spine for a design template with a torso section representing a torso and having at least one anatomical landmark; and
a shoulder belt being anchored to vehicle structure to extend between a first predetermined distance from a centerline of the seat to a should joint for the design template, said design template including at least one cross-sectional section cooperating with said torso section at an anatomical landmark and describing a body seat interface at the at least one anatomical landmark, the at least one cross-sectional section being

generally at a right angle to the torso section, the anatomical landmark being located on the body seat interface, the body seat interface described by the torso section and the at least one cross-sectional section being three dimensional.

62. (Currently Amended). A method of establishing occupant accommodation criteria in a vehicle package based on a predetermined class of vehicles comprising:

providing a design template having a torso section representing a torso, a leg section and at least one cross-sectional section of the torso, the torso section having at least one anatomical landmark, the at least one cross-sectional section generally being at a right angle to the torso section and cooperating with said torso section at the anatomical landmark to provide a three-dimensional ~~design template~~ body seat interface, the anatomical landmark being located on the body seat interface;

defining a planar region under an accelerator to provide a heel point for the leg section;

defining seat stiffness of a seat;

positioning the design template in the vehicle such that the eye line of sight is within vision requirements of the vehicle environment; and

positioning the design template in the vehicle such that the distance between the supplemental restraint system in the steering wheel to chest is as great as possible to provide a safe distance for each occupant driving the vehicle.

63. (Currently Amended). A method for designing a seat comprising:

providing at least one design template having a torso section representing a torso, a leg section, at least one cross-sectional section of the torso, the torso section having at

least one anatomical landmark, the at least one cross-sectional section generally being at a right angle to the torso section and cooperating with said torso section at the anatomical landmark to provide a three-dimensional body seat interface, the anatomical landmark being located on the body seat interface;

forming load supporting contours of the occupied seat for the at least one design template; and

forming unloaded patches of the unoccupied seat for the at least one design template.

64. (Currently Amended). A method of using a design template to design a vehicle seat comprising:

providing at least one design template having a torso section representing a torso and at least one cross-sectional section of the torso, the torso section having at least one anatomical landmark, the at least one cross-sectional section generally being at a right angle to the torso section and cooperating with said torso section at the anatomical landmark to provide a three-dimensional body seat interface, the anatomical landmark being located on the body seat interface;

establishing occupant accommodation criteria based on positioning the at least one design template in a predetermined class of vehicles to define occupied seat position to accommodate each design template on a seat having a seat cushion and a seat back in a vehicle representing the vehicle package criteria; and

defining at least one unloaded patch on the seat at a predetermined position;

defining at least one of a seat back height, seat cushion length, head restraint position, shoulder patch, thorax patch, lumbar patch, bite line patch, ischial patch, thigh patch, seat cushion bolster, and seat suspension for the seat relative to the design template.

65. (Currently Amended). A seat comprising:

- a seat cushion;
- a seat back associated with said seat cushion; and
- at least one of a seat back height, seat cushion length, head restraint position, shoulder patch, thorax patch, lumbar patch, bite line patch, ischial patch, thigh patch, and seat suspension being defined for said seat cushion and said seat back relative to a design template having a torso section representing a torso and at least one cross-sectional section of the torso, the torso section having at least one anatomical landmark, the at least one cross-sectional section generally being at a right angle to the torso section and cooperating with said torso section at the anatomical landmark to provide a three-dimensional body seat interface, the anatomical landmark being located on the body seat interface.